WHAT IS CLAIMED IS:

1. A continuous measurement-while-drilling surveying apparatus for surveying the drilling progress of a bottom hole assembly ("BHA") having a tool-spin axis and defining a central drilling fluid passage, said apparatus comprising:

(a) a fiber-optic gyroscope secured within or adjacent to the BHA and encircling the drilling fluid passage, said gyroscope having its sensitive axis aligned with the tool-spin axis; and

(b) first processing means for receiving the output of the gyroscope and producing a first signal representative of the angular velocity of the BHA about the tool-spin axis.

2. The apparatus of claim 1 further comprising:

(a) a second gyroscope mounted within or adjacent to the BHA and having its sensitive axis normal to the tool-spin axis; and

(b) wherein the first processing means includes means for receiving the output of the second gyroscope and producing a second signal representative of the angular velocity of the BHA about an axis normal to the tool-spin axis;

(c) accelerometer means for generating three acceleration signals representing the components of acceleration of the BHA along three mutually orthogonal axes and accelerometer processing means responsive to the acceleration signals for determining the angle of the BHA away from the vertical and for generating a third angular rotation signal representing rotation of the BHA about an axis normal to the sensitive axes of the first and second gyroscopes;

(d) second processing means responsive to the first, second and third angular rotation signals and the acceleration signals for transforming signals representing movement of the BHA in a BHA coordinate system to a earth local-level coordinate system; and

(e) third processing means operatively connected to the second processing means for determining the orientation of the BHA, determining the velocity changes of the BHA, updating the velocity components of the BHA and updating the position components of the BHA.

3. The apparatus of claim 2 further comprising a Kalman filter operatively connected to the third processing means.